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With international search report.

(54) Title: EXHAUST GAS CATALYST COMPRISING MULTILAYERED UPSTREAM ZONES

#### (57) Abstract

The present invention relates to an exhaust gas treatment catalytic article comprising an upstream catalytic zone and at least one downstream catalytic zone. The upstream catalytic zone comprises an upstream composition comprises a first upstream support, and at least one first upstream palladium component. The upstream zone can comprise one or more layers. The downstream catalytic zone comprises a first downstream layer comprising a first downstream support and a first downstream precious metal component. A second downstream layer comprises a second downstream support and a second downstream precious metal component.

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#### EXHAUST GAS CATALYST COMPRISING MULTILAYERED UPSTREAM ZONES

#### BACKGROUND OF THE INVENTION

### Field Of The Invention

The present invention relates to a catalyst apparatus useful for the treatment of exhaust gases, including motor vehicle engine exhaust gases, to reduce contaminants contained therein. More specifically, the present invention is concerned with a catalyst apparatus comprising an upstream catalyst zone and a downstream catalyst zone with improved catalysts including a "three-way conversion" or "TWC" catalysts. TWC catalysts are polyfunctional in that they have the capability of substantially simultaneously catalyzing the oxidation of hydrocarbons and carbon monoxide and the reduction of nitrogen oxides.

### Background of the Invention

15 Catalyst apparatus useful for the treatment of exhaust gases, including motor vehicle engine exhaust gases, to reduce contaminants contained therein which comprise an upstream catalyst zone and a downstream catalyst stages, also referred to as zones, are disclosed in the art as exemplified by U.S. Patent Nos. 5,010,051; 5,106,588 and 5,510,086.

Three-way conversion catalysts have utility in a number of fields including the treatment of exhaust from internal combustion engines, such as automobile and other gasoline-fueled engines. Emissions standards for unburned hydrocarbons, carbon monoxide and nitrogen oxides contaminants have been set by various governments and must be met, for example, by new automobiles. In order to meet such standards, catalytic converters containing a TWC catalyst are located in the exhaust gas line of internal combustion engines. The catalysts promote the oxidation by oxygen in the exhaust gas of the unburned hydrocarbons and carbon monoxide and the reduction of nitrogen oxides to nitrogen.

Known TWC catalysts which exhibit good activity and long life comprise one or more platinum group metals (e.g., platinum or palladium, rhodium, ruthenium and iridium) located upon a high

surface area, refractory oxide support, e.g., a high surface area alumina coating. The support is carried on a suitable carrier or substrate such as a monolithic carrier comprising a refractory ceramic or metal honeycomb structure, or refractory particles such as spheres or short, extruded segments of a suitable refractory material.

US Patent No. 3,993,572 discloses catalysts for promoting selective oxidation and reduction reactions. The catalyst contains platinum group metal, rare earth metal and alumina components which may be supported on a relatively inert carrier such as a honeycomb. Useful rare earth metals are disclosed to include ceria.

High surface area alumina materials, also referred to as "gamma alumina" or "activated alumina", typically exhibit a BET surface area in excess of 60 square meters per gram ("m²/g"), often up to about 200 m²/g or more. Such activated alumina is usually a mixture of the gamma and delta phases of alumina, but may also contain substantial amounts of eta, kappa and theta alumina phases. It is known to utilize refractory metal oxides other than activated alumina as a support for at least some of the catalytic components in a given catalyst. For example, bulk ceria, zirconia, alpha alumina and other materials are known for such use. Although many of these materials suffer from the disadvantage of having a considerably lower BET surface area than activated alumina, that disadvantage tends to be offset by a greater durability of the resulting catalyst.

In a moving vehicle, exhaust gas temperatures can reach 1000°C, and such elevated temperatures cause the activated alumina, or other support material to undergo thermal degradation caused by a phase transition with accompanying volume shrinkage, especially in the presence of steam, whereby the catalytic metal becomes occluded in the shrunken support medium with a loss of exposed catalyst surface area and a corresponding decrease in catalytic activity. It is a known expedient in the art to stabilize alumina supports against such thermal degradation by the use of materials such as zirconia, titania, alkaline earth metal oxides such as baria, calcia or strontia or rare earth metal oxides, such as ceria, lanthana and mixtures of two or more rare earth metal oxides. For example, see C.D. Keith et al U.S. Patent 4,171,288.

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cooling air taken from outside towards said optical component; and a distribution means 51a-c for distributing said cooling air in quantities which correspond to respective different temperatures (measured by sensors 36a-c) that a plurality of said optical components. The distribution means includes regulation means (sensors 36, control circuit, drive circuit col. 5, lines 46-59) for regulating the cooling air which flows towards the optical component(s). As seen in figure 2 body element 19 contains all of the internal elements of the projector. The applicant is directed to also review figures 1-4 and 6 as well as col. 5, lines 46-59 and col. 6, lines 8-41.

## Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claim 1 is rejected under 35 U.S.C. 103(a) as being unpatentable over Chimura (U.S. Pub. No. 2003/0202160) in view of Hashimukai (U.S. Patent No. 5,993,008). Chimura teaches a light source 53; a power source section 52 for supplying electric power for driving at least said light source; a box for housing said optical system 1, said light source and said power source section; an exhaust means for exhausting air within said box by using an axial fan 9; and a cover member for covering at least an upper surface of said box 21; wherein an outlet of said exhaust means 45 (lower depicted in figures 8B & 8C) is provided in a bottom side of said box. Chimura does not teach an optical system for modulating illumination light output from said light source based on input image information. Hashimukai teaches that it was known to use a

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modulating system (image display using liquid crystal (c) col. 1, line 39). It would have been obvious to one of ordinary skill in the art at the time the invention was made to utilize the features taught by Hashimukai for the purpose of providing moving pictures.

## Allowable Subject Matter

Claims 2-8 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

## Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Christopher E. Mahoney whose telephone number is (571) 272-2122. The examiner can normally be reached on 8:30AM-5PM, Monday-Thursday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Judy Nguyen can be reached on (571) 272-2258. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

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Christopher E Mahoney Primary Examiner

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